ment impossible. The bad weather held on, and we were forced to abandon further attempts. This was May 12. From May 4 till the 12th we had three fine clear mornings till 9.30 a.m., and during the rest of the time the snow fell incessantly and thick mists obscured the mountains. The snow conditions made the going terribly tedious, and without at least three consecutive days' fine weather Pandim would have been impossible, whatever the actual difficulties of climbing. Making forced double marches back to Darjeeling by the short route through Chakung, we arrived on May 18. The monsoon had set in without mistake, as the mountains were obscured and rain fell every day.

As regards expenses, the whole cost of food, porterage, pay, and equipment for the five Everest porters, Sirdar and cook, for thirty-two days away from Darjeeling, with the extra coolies required from Darjeeling to the snow-line, amounted to Rs.1200, or about £90.

Mr. Shebbeare, who gave me such great assistance before leaving Darjeeling, has established a sort of depôt in his house of Whymper tents, cooking-pots, alpine rope, and alpine cookers for mountain expeditions towards Kangchenjunga. This depôt and his advice proved invaluable. It is advisable to take sufficient ice-axes for all the porters to Darjeeling.

THE TWO-HUNDREDTH ANNIVERSARY OF THE BIRTH OF GENERAL ROY

Colonel Sir Charles Close, K.B.E., F.R.S.

WILLIAM ROY may be looked upon as the real founder of the Ordnance Survey, though he did not live to see its official establishment. It was due to his persistence and energy that the idea of a National Survey Department took shape, and he was much concerned with two undertakings which carried in them the germ of the future development of the Survey. In 1747 he served as a subordinate in the Quartermaster-General's Department under Lieut.-General Watson, the Deputy Q.M.G. In Roy's words, "This officer, being himself an Engineer, active and indefatigable, a zealous promoter of every useful undertaking, and the warm and steady friend of the industrious, first conceived the idea of making a map of the Highlands. As Assistant Quartermaster, it fell to my lot to begin, and afterwards to have a considerable share in, the execution of that map." The map was "a magnificent military sketch," on the scale of 1000 yards to the inch, and it was eventually extended to cover the whole of the mainland of Scotland. Work on this map was stopped on the outbreak of war in 1755.

Then comes a long interval, during which Roy was unable to do much towards the furtherance of his favourite project of a National Survey.

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We find him on reconnaissances in 1756, in the Rochfort expedition of 1757, at the battle of Minden, which was fought on 1 August 1759; D.Q.M.G. in Germany 1760–63; and in 1765 Surveyor-General of Work and Engineer for making and directing Military Survey in Great Britain. This latter post he retained until his death. In the 'seventies he was very busy with horizontal observations with his quadrant, and with experiments on the use of barometers for determining heights.

At the end of 1783 Cassini de Thury proposed that the observatories of Greenwich and Paris should be connected by a chain of triangles. Cassini's memorandum was referred by the British Government to the Royal Society, and the upshot of it all was that Roy measured a base on Hounslow Heath, somewhat more than 5 miles long, in August 1784. From this base, after nearly three years' delay, caused by Ramsden's dilatoriness in making the 3-foot theodolite (the father of all accurate theodolites), a chain of triangulation was extended which connected the two observatories. This work was finished in 1788. Roy wrote just before he died, in July 1790, that he could not help "considering it as being incumbent on him to recommend that the trigonometrical operation, so successfully begun, should certainly be continued, and gradually extended over the whole island. . . . The honour of the nation is concerned in having at least as good a map of this as there is of any other country." He also strongly urged that the terminal points of the base should be protected and preserved.

In his time these terminal points were marked by wooden pipes. When Mudge re-measured the base in 1791, he marked the ends by guns, fixed vertically in the soil, muzzles upward. These guns still remain in position.

A year or two ago it was realized that the two-hundredth anniversary of Roy's birth was approaching. Actually Roy was born on 4 May 1726, at Milton Head in Carluke parish, Lanarkshire. It was thought that if the occasion was to be commemorated, no better way could be found than by protecting the terminal points of his base on Hounslow Heath by such precautions as might suggest themselves, and by affixing a suitable tablet to each gun. The Director-General of the Ordnance Survey identified himself with the scheme and worked out the details, and the Treasury permitted the necessary small expenditure to be defrayed out of the Ordnance Survey vote. Circumstances prevented the work being finished in 1926, but everything was ready early in 1927, and the Astronomer Royal, Sir Frank Dyson, representing the Royal Society, unveiled the tablet on the south-eastern gun on 22 February 1927, in the presence of representatives of the Ordnance Survey, Board of Agriculture, Survey of India, G.S.G.S., R.G.S., the parish of Carluke, and the Trustees of the Hampton Charities.

Two memorial plates have been fixed, one on each of the terminals, which are guns buried vertically in the ground. They are identical,

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except that one bears the words "N.W. terminal," the other "S.E. terminal." The N.W. terminal is in a field known as King's Arbour, 4 miles west of Hounslow. The site of this terminal is Crown Property. The memorial unveiled was that on the S.E. terminal at Hampton Hill. This terminal is situated on land which is now the property of the Trustees of the Hampton Parochial Charities. A small fence has been erected round this terminal, with the permission of the Trustees. The plates are inscribed as follows:

THIS TABLET WAS AFFIXED IN 1926 TO COMMEMORATE THE 200TH ANNIVERSARY OF THE BIRTH OF

MAJOR-GENERAL WILLIAM ROY, F.R.S.

BORN 4TH MAY, 1726—DIED 1ST JULY, 1790

He conceived the idea of carrying out the triangulation of this country and of constructing a complete and accurate map, and thereby laid the foundation of the ORDNANCE SURVEY. This gun marks the S.E. terminal of the base which was measured in 1784, under the supervision of General Roy, as part of the operations for determining the relative positions of the Greenwich and Paris Observatories—This measurement was rendered possible by the munificence of H.M. King George III, who inspected the work on 21 August 1784—The base was measured again in 1791 by Captain Mudge, as the commencement of the principal triangulation of GREAT BRITAIN.

LENGTH OF BASE reduced to M.S.L.

As measured by Roy	27404·01 feet
„ „ „ Mudge	27404·24 „
As determined by Clarke in 1858 in terms of the Ordnance Survey Standard O_1	27406·19 „

Col.-Commdt. E. M. Jack, Director-General of the Ordnance Survey, said: Before asking the Astronomer Royal to unveil this memorial I would like to explain briefly the circumstances which led to its erection. Rather more than a year ago, it was proposed to me that we should celebrate the 200th Anniversary of General Roy's birth by putting up a suitable memorial. I accepted the proposal with pleasure. Certain unavoidable delays occurred in putting the work in hand, with the result that instead of meeting in May 1926, as we had hoped, we are meeting to-day.

I would like to take this opportunity of acknowledging the permission given by the Trustees of the Hampton Parochial Charities for the enclosure of this terminal. They showed themselves sympathetic to the proposal, and met us as far as it was possible for them to do. I wish also to acknowledge very gratefully the help given by Mr. Mason, the present tenant of the site. He has helped us in every possible way, even to having ground cleared at his own expense. We are very grateful to him.

Sir Frank Dyson, Astronomer Royal, narrated briefly how Roy was led to take an interest in matters geodetic and cartographic, and described how in 1763 the Government considered making a general survey of the Island, and

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putting Roy in charge. Nothing was done; but Roy, in the course of his military employment, noted situations adapted to the measurement of bases and for the formation of great triangles. In 1783, for his own private amusement, he measured a base from Jew's Harp to Pancras, and carried out a small triangulation. He hoped that it might interest the public. In the same year (1783) came the French proposal that we should assist in establishing the connection between the Observatories of Greenwich and Paris. The proposal was passed to Sir Joseph Banks, P.R.S., and he suggested that Roy should be put in charge of the work. Roy selected a site for a base on Hounslow Heath. In April 1784 the site was examined, and for the work of clearing and assisting in the measurement a party of twelve N.C.O.s and men of the 12th Foot were ordered from Windsor. A 100-foot steel chain was made by Ramsden. It was proposed to measure the base with deal rods, this method having been adopted in several countries. Three 20-foot rods were accordingly made, and the complete measurement (much interrupted by bad weather) was carried out during July and August 1784. During this measurement it was found that the rods varied so much with atmospheric conditions that they could not be relied on.

It was determined to measure the base again. On the suggestion of Lieut.-Col. Calderwood it was decided to use glass rods; these were constructed, with various refinements for getting an exact length. Roy was anxious to make the second measurement with both glass rods and the 100-foot chain, and on August 18 the measurement was begun again on this system. Owing to the delays involved the chain measurement was however discontinued; but that with the glass rods was completed on August 30.

Sir Joseph Banks was present throughout both measurements, and gave every assistance both in the way of scientific aid and "elegant refreshment" for visitors. King George visited the base on August 21, and spent two hours inspecting the work.

Mudge re-measured the base in 1791. He decided to do this for three reasons:

(1) That a measurement of such importance ought to be done twice in any case:

(2) That there was the possibility of certain errors in first measurement:

(3) That it was desirable to compare measurement by chain with that by glass rods.

The base was measured with the new chains in August and September, 1791, the result being in close concordance with that of Roy. For the Primary Triangulation the mean of the two measurements was taken. On the last day of the second measurement Dr. Maskelyne, Astronomer Royal, was present.

The terminals of the base had been marked by Roy by wooden pipes sunk in the ground. These were found by Mudge to be in a very decayed state; and he accordingly replaced them by heavy guns, every precaution being taken to ensure that the axes of the guns were in the same positions as those of the original pipes.

Sir Charles Close, in thanking the Astronomer Royal, said: It is most appropriate that an Astronomer Royal should have undertaken to carry out this little ceremony; for various Astronomers Royal have taken great interest in the Ordnance Survey, and at times have materially helped that Department in its more scientific labours. More than this, if it had not been for the Royal Observatory at Greenwich, the Ordnance Survey would not have commenced its accurate measurements as early as 1784. The measurement of the Hounslow

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Heath Base in that year was due to a suggestion by the third Cassini that the Observatories of Greenwich and Paris should be connected by a triangulation. His memorandum, though it produced such excellent results, was a tactless document. In it he roundly declares that there was an uncertainty in the longitude of Greenwich (with reference to Paris) of about 11 seconds, and in the latitude of about 15 seconds. What can have induced him to write such a remark about the latitude must remain a mystery. Maskelyne, the Astronomer Royal, was somewhat indignant, and wrote a rejoinder, in which he pointed out that the latitude of Greenwich was probably established without the error of a single second. However, the tactless wording of the suggestion was not allowed to interfere with the project of joining the two observatories.

Ten years earlier Roy and Maskelyne had been in correspondence about the Schiehallien experiments to determine the density of the Earth. Maskelyne was present at the re-measurement of the Hounslow Heath Base by Mudge in 1791. So far as I know, no Astronomer Royal has visited the base from that date until to-day.

In 1802 Mudge was at Greenwich testing Ramsden's new zenith sector, and in his report he acknowledges the value of the advice and instruction which he had received from Maskelyne in the matter.

We do not hear so much about John Pond, Maskelyne's successor, in connection with the Survey, but with the advent of Airy, in 1836, there is a change, and we find him and Colby in constant communication. Airy's Figure of the Earth was adopted by the Survey shortly after its publication in 1830. Airy also designed a new zenith sector for use in determining the latitudes of geodetic stations in the British Isles; this was in 1841. It was largely due to Airy, also, that Mean-Sea-Level was adopted as the datum for heights. Airy and Colby were very good friends, and after 1838, when Colby was living in London for a few years, Airy says that he "and his family had the gratification of receiving him very often at our Sunday dinner at Greenwich" (dinner was then at 3.30), and he goes on to pay a tribute to Colby's talents and unselfish public spirit.

I have said, perhaps, enough to show how closely in touch with Maskelyne and Airy were the founders of the Ordnance Survey, Roy, Mudge, and Colby, and how advantageous to the Survey this friendly alliance was. Sir Frank Dyson's presence here to-day is evidence that the tradition, now 170 years old, is still alive, and that the two national institutions, though less immediately in contact than they were in the past, are still aware of each other's existence. On behalf of all present I beg to thank Sir Frank Dyson for his friendly co-operation in doing honour to the memory of General Roy.

The following note is kindly sent by the Clerk to the County Council of Lanarkshire:

"William (General) Roy was the son of John Roy, gardener and Land Steward in the service of the Hamiltons of Hallcraig. His grandfather held the same post, and his uncle James Roy acted in a somewhat similar capacity under the Lockharts of Lee. General Roy and his brother James were educated at the school of their native parish (Carluke, Lanarkshire) under Mr. John Russell, and the former partly at the Grammar School of Lanark; it is uncertain whether General Roy had the benefit of any higher scholastic training. Old Ann Alexander, long a servant at Lee, used often to relate that General Roy, during her

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service, came to 'The Lee' on three occasions: on the first occasion he dined in the servants' hall; next time he came he dined with the family; and at his third visit, which would be in 1764, when surveying the military works of the Romans in the neighbourhood, he sat at the right hand of the Laird."

REVIEWS

EUROPE

Wanderings in Roman Britain.— Arthur Weigall. London: Thornton Butterworth. 1926. 7½ × 5½, pp. 342. *Sketch-map and Illustrations.* 6*s. net.*

MR. ARTHUR WEIGALL'S perambulation of Roman Britain, with the aim of satisfying the curiosity of the general public, was well worth while. Archæologists and historians are busy in various corners of their two fields, but few of them are able to appeal to a wide circle of readers. Mr. Weigall has just the right equipment for his task: he is both archæologist and historian, capable of taking a comprehensive view of the hundreds of sites he visited, and the wielder of a facile pen. His book, though by no means exhaustive, covers a great deal of ground, as may be seen from the index of Roman sites arranged under counties, and from the excellent art-paper map, generously supplied at both ends. The outstanding things are all here. A useful feature, and one that deserves expansion, is the setting forth of some of the chief objects shown in local museums. How these objects tend to be hidden, and how hard is it to know where to look for many unique specimens! Could not the Museums Association undertake the compilation of a Roman British list giving the *locale* of important specimens? Mr. Weigall properly lays stress on the "uncontrovertible but little-appreciated fact that the blood of the heterogeneous Romans still runs in our veins"; and he puts in a timely plea for the "endowment of scholarships and professorships for the training of field workers and students in practical archæology." Truly the harvest is plenteous, but the workers are parlous few and the funds ridiculously inadequate for the full development of this important side of our national life. S. E. W.

Suffolk Sea-Borders.— H. Alker Tripp. London: John Lane. 1926. 5½ × 7½, pp. xii. + 254. *Eight Plates in Monochrome and* 101 *Text Figures.* 8*s.* 6*d. net.*

In any book ever published it is probable that some points offer themselves for criticism. The present volume does afford a few minor points of this sort, but it is not proposed to deal with them here. The book, from cover to cover, is most interesting and instructive. The writer really does make one feel the past greatness of the Suffolk shore. Every mud-flat, every beach he describes are real, and to one who knows and loves them they live again.

The theme of the book is an inconsequent yachting cruise along the Suffolk coast and its tortuous estuaries and Broads. It is very fully illustrated with some excellent pen-and-ink sketches and a few plates. Every lover of the Suffolk coast should read this book, no matter how well he knows the shore. Perhaps the highest praise we can give is to ask the writer to produce a similar work on the other—and not less interesting—parts of the East Anglian coast.

J. A. S.

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